# Marketplace or reseller?

Andrei Hagiu
Julian Wright

Working Paper

13-092

July 10, 2013

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Andrei Hagiu[†] and Julian Wright[‡]

July 2013

**Abstract**

Intermediaries can choose between functioning as a marketplace (on which suppliers sell their products directly to buyers) or as a reseller (purchasing products from suppliers and selling them to buyers). We model this as a choice between whether control rights over a non-contractible decision variable (the level of marketing activities) are better held by suppliers (the marketplace-mode) or by the intermediary (the reseller-mode). Whether the marketplace or the reseller mode is preferred depends on whether independent suppliers or the intermediary are better suited to optimally tailor marketing activities for each specific product. We show that this tradeoff is shifted towards the reseller-mode when marketing activities create spillovers across products and when network effects lead to unfavorable expectations about supplier participation, whereas it is shifted towards the marketplace for long-tail products. We thus provide a theory of which products an intermediary should offer in each mode.

*JEL classification:* D4, L1, L5

Keywords: Intermediation, multi-sided platforms, control rights, marketing.

# 1  Introduction

Retailers like 7-Eleven, Eastbay.com, Lowes and Zappos.com act as intermediaries by reselling the products they purchase from suppliers to buyers. Other intermediaries, such as Alibaba.com, eBay.com, Premium Outlets, and Simon Malls act as marketplaces, in which suppliers sell directly to buyers via a platform. In the existing literature, the intermediation model — reseller or marketplace — is taken as given. It is important to recognize, however, that intermediaries can often choose under which mode to operate.

For example, most electronics retailers function as resellers. They take ownership and control over products from branded suppliers and choose how to sell them in their stores (layout, pricing, promotions, emphasis, etc.). Recently, however, the largest such retailer in the United States, Best Buy, has taken a step towards the marketplace-mode by allowing Apple, Samsung and Microsoft to launch their own mini-stores within Best Buy stores (Apple in 2011, Microsoft and Samsung in 2013). These brands control the product layout in these mini-stores, staff them with their own product specialists and Samsung even offers its own checkout service.[1] Similarly, Buy.com was founded in 1997 as a pure online reseller, but starting in 2006 it aggressively expanded its marketplace offering. By 2010, when it was acquired by Rakuten, Japan's largest online shopping mall, Buy.com was a hybrid, with sales roughly evenly distributed between the reseller and the marketplace modes.[2] In 2013, it was rebranded Rakuten.com Shopping and was reportedly moving towards a 100% marketplace mode.[3] An example of a transition in the opposite direction is provided by Zappos.com, the leading online shoe retailer in the U.S., which started off in 1999 as a marketplace, before turning itself into a pure reseller by the mid-2000s. Other examples where intermediaries make such choices include: department stores (resellers for some product categories and marketplaces for others, most notably cosmetics, where branded suppliers control independent counters); Amazon (started off as a pure reseller but now operates as a marketplace as well); digital content intermediaries (e.g. Comcast, DirecTV, Apple's iTunes and Netflix operate as resellers, whereas Apple's iPhone App Store and Google Play operate mostly as marketplaces).

This paper analyzes the choice facing an intermediary between operating as a marketplace, as a

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[1] See "Best Buy to Carve Out Microsoft Mini-Stores," by Shira Ovide and Ann Zimmerman, 13 June 2013, *The Wall Street Journal*; "Samsung Sets Up Boutique in Best Buy; Electronics Retailer Will Have Dedicated Boutique for When Galaxy S4 Debuts," by Ann Zimmerman, 4 April 2013, *The Wall Street Journal.*

[2] Geoffrey A. Fowler and Daisuke Wakabayashi "Japan's Rakuten to Acquire Buy.com," *Wall Street Journal*, 21 May 2010.

[3] http://dealnews.com/features/Buy.com-to-Become-a-Marketplace-only-Site-Hopes-to-Take-on-Amazon/661313.html

reseller, or as a hybrid, having some products offered under each of the two different modes. What are the trade-offs that drive an intermediary to adopt one mode over the other, or both? We present a formal model for analyzing some of the fundamental tradeoffs that arise in comparing resellers with marketplaces, and determining which products to offer under each mode.

We take the view that a fundamental distinction between marketplaces and resellers is the allocation of control rights between independent suppliers and the intermediary over non-contractible decisions (prices, advertising, customer service, responsibility for order fulfillment, etc.) pertaining to the products being sold. In the case of a pure marketplace, all of these residual control rights rest with independent suppliers. In the case of a pure reseller, all residual control rights rest with the intermediary (i.e. the reseller).

In our model, we focus on a single, non-contractible decision variable, which can be interpreted as the level of some marketing activity that occurs through this particular intermediary and that is undertaken by the party holding residual control rights (i.e. the reseller, or each independent supplier in the case of a marketplace). Examples of such an activity include the design of the product, displays and descriptions (physical or online), or the training of sales people to promote specific products. The intermediary and the suppliers each have private information about the ideal choice of the marketing activity. Drivers of the optimal intermediation mode that we analyze include the relative importance of the suppliers' versus the intermediary's private information, the presence of spillovers across products generated by marketing activities, whether products are long-tail or short-tail, and a possible chicken-and-egg problem faced by the marketplace when suppliers hold unfavorable expectations about other suppliers' participation on the marketplace. We also establish conditions under which a hybrid mode is optimal and characterize its optimal design in such cases. Our article thus offers a guide to how intermediaries should optimally position themselves between the two different modes.

## 1.1 Literature review

The marketplaces we study are a type of multi-sided platform (or two-sided market). Multi-sided platforms are organizations that get two or more sides on board and enable direct interactions between them. In the case of marketplaces, the two sides are buyers and sellers, and the interaction is the commercial trade between them. Thus, our framework does not fit all types of multi-sided platforms. In particular, when the two sides are not trading a "product" that can be purchased and resold, the choice to become a reseller does not arise (e.g. a nightclub). Nevertheless, marketplaces are an

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important subclass of multi-sided platforms.

Our contribution to the literature on multi-sided platforms departs from the seminal models in the two-sided market literature (e.g. Armstrong 2006, Caillaud and Jullien 2003, Parker and Van Alstyne 2005, Rochet and Tirole 2006) by focusing on the role of non-contractible decisions and whether the intermediary or the third-party suppliers have control rights over these decisions — a novelty in this literature. An important corollary of our modelling is that the specification of residual control rights helps distinguish multi-sided platforms from resellers. The existing literature on two-sided markets has struggled with this issue. According to some existing definitions, grocery stores are examples of multi-sided platforms even though many economists think they are not (e.g. Rochet and Tirole, 2006, and Rysman, 2009). At the same time, we extend the existing literature by considering multi-sidedness as a choice rather than as a given characteristic of industries or firms. Thus, our work is related to recent efforts to expand the formal study of strategic decisions made by platforms beyond pricing (see, for example, Nocke *et al.*, 2007, Gawer and Henderson, 2007, Gawer and Cusumano, 2008, Boudreau, 2010, Eisenmann *et al.*, 2011, Hagiu and Jullien, 2012, Parker and Van Alstyne, 2012, Gawer and Phillips, 2013).

The importance of the strategic choice between marketplaces and resellers, and some of the tradeoffs that can arise are discussed in Hagiu (2007) and Hagiu and Wright (2011, 2013). This paper formalizes a framework in which the allocation of residual control rights creates meaningful distinctions between the two modes, and emphasizes fundamental tradeoffs that were not raised in these earlier works. Note that our focus is on control rights and not on the specific mechanisms through which a marketplace or a reseller reduce buyer and seller search and transaction costs (such as in, Bakos, 1997).

By equating the difference between marketplaces and resellers to the allocation of residual control rights between independent suppliers and the intermediary, our work is loosely related to the voluminous literature on vertical integration and the theory of the firm. However, rather than studying "make versus buy" decisions, we study "enable versus resell" decisions, which involves quite a different economic analysis. More closely related to our paper is a literature on organizational design which explores whether centralized or decentralized decision-making is better. At a high level, we share with this literature the focus on non-contractible decisions (ex-ante and ex-post) and on the underlying tradeoffs that arise from allocating the relevant decision rights to different parties: loosely speaking, centralization corresponds to our reseller mode and decentralization corresponds to our marketplace mode. See, for example, Alonso et al. (2008, 2013), although their focus on strategic communication (their 2008 paper) and the tradeoff between information breadth and depth (in their 2013 paper) is

very different from ours.

Finally, our work relates to the recent work by Gans (2012), Foros et al. (2013) and Johnson (2013a and b) that analyzes the agency model (suppliers set prices and share revenues with downstream retailers) and contrasts it with the traditional wholesale model (suppliers set wholesale prices and retailers set retail prices). These articles explore the implications of specific contract forms that have recently emerged in the selling of digital content (e.g. application stores and e-books). Our article complements this emerging literature given that contract forms are largely neutral in our analysis — we instead focus on the role of private information and non-contractible decisions.

# 2 Model set-up

There are $N > 1$ independent suppliers. Each supplier $i = 1, ..., N$ has a unique product. The marginal cost of supplying each product (i.e. the opportunity cost to suppliers of providing the product for sale) is normalized to zero. This is without loss of generality given that below we introduce a positive marginal cost of transactions. To sell the products to buyers, suppliers must go through a monopoly intermediary.

Initially, in our model all products (and all suppliers) are treated symmetrically. This allows us to show the trade-offs we are interested in most clearly when focusing on the choice between a pure reseller ($R$) and a pure marketplace ($M$). The role of asymmetries are discussed at the end of section 3, as well as in section 4 where they provide a natural explanation of why intermediaries may prefer a hybrid mode.

## 2.1 Demand structure

There is a continuum of many identical buyers. Each buyer is willing to pay $v$ for each product she is interested in, where $v$ is commonly known. In order to access the products, buyers must affiliate with (i.e. join) the intermediary, which we assume is costless.

We assume that the number of buyers for product $i$ is

$$m - (a_i - a_i^*)^2 \,,$$

where $a_i$ is the level of marketing activities that the owner of product $i$ (supplier $i$ or the reseller)

chooses, and where

$$a_i^* = \theta + \gamma_i + \delta_i$$

is the ideal choice of marketing activity for product $i$. We have in mind activities that take place at or over the intermediary and that help attract (and convert) buyers by making them more aware of the product being marketed. We assume $\theta$ is commonly known. The term $\gamma_i$ is an i.i.d. random variable, whose realization is private information known to the intermediary at the time it chooses its marketing activities. Similarly, the term $\delta_i$ is an i.i.d. random variable, whose realization is private information known to supplier $i$ at the time the supplier chooses its marketing activities. The random variables $\gamma_i$ and $\delta_i$ are drawn independently for all $i$, and they have expected values equal to zero and variances denoted $V_\gamma$ and $V_\delta$, respectively.

An intermediary or supplier that was fully informed of $\gamma_i$ and $\delta_i$ would be able to choose the ideal marketing activity for product $i$ and thereby achieve the highest level of demand possible (i.e. $m$). Absent full information, neither suppliers nor the intermediary can expect to choose the ideal level of marketing activities. The extent to which the owner of product $i$ (supplier $i$ or the reseller) is expected to be less effective depends on the variance of the component of $a_i^*$ that it does not observe. Thus, the relative importance of the intermediary's versus the suppliers' local information is captured by the comparison between $V_\gamma$ and $V_\delta$.

## 2.2  Cost structure

If the intermediary is a marketplace, each individual supplier incurs a fixed cost, denoted $F_M > 0$, which is the cost of setting up the capability of selling on the marketplace. Each supplier also incurs a constant transaction cost of selling each unit of its product, equal to $f_M$. If the intermediary is a reseller, it incurs a fixed cost $F_R > 0$ for each product it offers (e.g. the costs of quality control, inventory capacity, contractual arrangements, etc). $R$'s transaction cost of selling each unit of a product is equal to $f_R$. We add the natural assumption that $v > f_k$, and that

$$(v - f_k)\left[m - \max\left(V_\delta, V_\gamma\right)\right] > F_k, \tag{1}$$

for $k \in \{M, R\}$, so the profit from each product is positive regardless of whether it is offered under the *R-mode* or the *M-mode*.

Initially, we assume that $f \equiv f_M = f_R$ and $F \equiv F_M = F_R$, so that the cost structure of supplying

$n$ products is the same under the two different modes of intermediation. This assumption will be relaxed in section 3.2 where we focus on cost differences that can affect the choice between the two modes. We normalize the fixed costs of setting up an intermediary (i.e. before it sells any products) to zero, regardless of its mode.

## 2.3 Pricing instruments and control rights

If the intermediary chooses the *R-mode*, it makes a take-it-or-leave-it contract offer to $n \leq N$ suppliers. The offer consists of the price $R$ will pay for each unit it buys, in exchange for which $R$ obtains the control rights over marketing and pricing to buyers. $R$ then chooses the level of marketing activities and prices offered to buyers for all products whose suppliers have accepted the contract offer. As will be noted below, the pricing choice is trivial in our model, so only control over marketing decisions matters. Whenever it makes a sale to buyers, $R$ pays the contract price to the corresponding supplier.

If the intermediary chooses the *M-mode*, its take-it-or-leave-it contract offer to $n \leq N$ suppliers consists simply of a fixed participation fee $P$ that each supplier must pay in order to join. In our benchmark setting, restricting $M$ to a participation fee is without loss of generality: it would not do any better if it were able to observe supplier sales and charge variable fees. Where there is a role for variable fees, this will be explicitly noted and analyzed. Participating suppliers maintain control over marketing activities and pricing to buyers, to whom they sell directly. In particular, there is no access fee to buyers. As will become clear below, this assumption is immaterial since in our benchmark model, buyers are left with zero surplus.

Consistent with our distinction between marketplaces and resellers, we assume only one party ($R$ or the corresponding supplier $i$) has control rights over marketing activities corresponding to a given product $i$ that affect consumer demand through this particular intermediary. This does not rule out that suppliers may also choose marketing activities through other channels than the intermediary, but these are assumed to work independently of the activities we are studying, so we abstract from them. We also assume the choices of marketing activities are non-contractible.

The reason we have chosen marketing activities as the focal decision variable is two-fold. First, in many real-world contexts, prices are set by contracts between suppliers and intermediaries (e.g. through resale price-maintenance agreements). In such contexts, pricing decisions do not create any meaningful economic distinctions between marketplaces and resellers. In contrast, marketing activities are much less likely to be contractible. For instance, it would be very hard for Sony to enforce specific

ways in which Best Buy sales people are supposed to talk about Sony products to customers. The only realistic way Sony could do this would be to have its own sales people in Best Buy stores — a situation which is captured by the marketplace mode in our model. Second, from a modelling perspective, it turns out that working with marketing activities is quite tractable and allows us to explore a broad range of tradeoffs. For completeness, in section 5.3 we consider a version of our model with prices as the non-contractible decision variables and note that our main findings still hold.

## 2.4 Timing

The timing we assume throughout is as follows:

| Stage 0. Intermediary chooses mode — Reseller or Marketplace | |
|---|---|
| **Reseller** | **Marketplace** |
| Stage 1. Reseller makes take-it-or-leave-it offer to suppliers; suppliers decide whether or not to accept. | Stage 1. Marketplace sets the fixed participation fee $P$ to suppliers; suppliers decide whether or not to participate. |
| Stage 2. Reseller learns $\gamma_i$ for each product and decides on prices to buyers and the level of marketing activities for all products it has acquired. | Stage 2. Each supplier learns its $\delta_i$ and decides on its price and level of marketing activity. |
| Stage 3. Buyers make purchase decisions. | Stage 3. Buyers make purchase decisions. |

These particular timing assumptions are not critical to our analysis. The important assumption is that parties should learn their private information prior to making their decisions about marketing activities. We denote by $E_R(.)$ the expectation taken by $R$ and by $E_i(.)$ the expectation taken by supplier $i$ *after* they learn their private information. We denote by $E(.)$ the expectations taken by either party *prior* to learning their private information.

Some straightforward implications follow from our timing assumption. First, in all cases, the owner of each product $i$ (supplier $i$ or $R$) charges buyers a price equal to $v$, which extracts the entire buyer surplus. Indeed, an informed buyer that wishes to purchase product $i$ does so whenever her opportunity cost of going to the intermediary (zero by assumption) plus the price charged for the product is less than or equal to her willingness-to-pay $v$. This allows us to focus on the key tradeoffs between the two modes without introducing any pricing distortions on the buyer side. Since pricing does not depend on local information in any way, it does not produce any meaningful difference between the two modes of

intermediation in our model. Thus, whether prices can be contracted or not is irrelevant in our setting. Instead, all the action is concentrated in the choices of marketing activities. Second, the intermediary has all the bargaining power. It therefore extracts the entire *expected* surplus from all participating suppliers. As a result, in the benchmark model, total intermediary profit and total expected surplus (or welfare) are the same. This will change in section 3.3, where $M$ suffers from unfavorable supplier expectations.

# 3 Key tradeoffs

This section presents the analysis and results for the benchmark setting outlined in the previous section, in the case of an intermediary choosing between the *R-mode* and the *M-mode*. We then introduce the possibility of spillovers, cost differences and network effects to highlight other important tradeoffs between the two modes.

**Reseller** $R$'s optimal contract offer to suppliers is to offer each unit at a price of zero — suppliers accept since it meets their opportunity cost, which we have normalized to zero. Suppose $R$ makes the offer to $n \leq N$ suppliers, so that it can sell $n$ products to buyers. $R$ then decides on $a_1, ..., a_n$ to maximize its expected profit from selling the different products.

The reseller sets $a_1, ..., a_n$ together to maximize expected joint profit after observing $\gamma_1, ..., \gamma_n$, but without observing $\delta_1, ..., \delta_n$. The reseller's expected profit at stage 2 can be written as

$$\Pi_R(n) = (v - f) \sum_{i=1}^{n} E_R \left[ m - (a_i - (\theta + \gamma_i + \delta_i))^2 \right] - nF. \tag{2}$$

Taking first order conditions and using that $E_R(\delta_i) = 0$, we obtain the optimal level of marketing activities for each product

$$a_i^R = \theta + \gamma_i. \tag{3}$$

Substituting (3) into (2), the reseller's expected profit is $(v - f)(m - V_\delta) - F$ per product. Given (1), this is positive so the reseller offers all $N$ products to obtain the expected profit

$$\Pi_R = N \left( (v - f) [m - V_\delta] - F \right). \tag{4}$$

**Marketplace** In this mode, suppliers maintain control rights over their marketing decisions $a_i$. Supplier $i$'s expected profit net of the participation fee $P$, evaluated at stage 2, is

$$\pi_i = (v - f) E_i \left[ m - (a_i - (\theta + \gamma_i + \delta_i))^2 \right] - F - P, \tag{5}$$

where supplier $i$ observes its own $\delta_i$ after joining the platform (but not any $\gamma_i$ or any other $\delta_j$). Taking first order conditions and using that $E_i(\gamma_i) = 0$, we obtain the optimal level of marketing activities for each product

$$a_i^M = \theta + \delta_i. \tag{6}$$

Substituting (6) into (5), supplier $i$'s expected profit from participating with $M$ is

$$\pi_i = (v - f) [m - V_\gamma] - F - P.$$

$M$ can set $P = (v - f)(m - V_\gamma) - F$ per supplier, which is positive given (1). It will therefore want to attract all $N$ suppliers to obtain an expected profit of

$$\Pi_M = N \left( (v - f) [m - V_\gamma] - F \right). \tag{7}$$

Comparing (4) with (7), we obtain the following benchmark result

**Proposition 1** *The $M$-mode is preferred to the $R$-mode if and only if the variance of the suppliers' local information exceeds the variance of the intermediary's local information, i.e. if and only if $V_\delta \geq V_\gamma$.*

The condition above provides a simple benchmark to evaluate reseller-versus-marketplace tradeoffs. Control should be given to the party whose information is more important in terms of how best to design marketing activities. Note this comparison does not depend on the assumption that $m$, $\theta$, or $F$ are the same for each product. The result would be identical if these varied across products in some way which was equally observed by suppliers and the intermediary. Our result also did not depend on $M$ being assumed to charge only a fixed participation fee. If $M$ could observe sales and also set a variable fee per unit of sales, this would reduce the supplier's margin from each sale, but not the choice of marketing activities. As a result, the effect would be to just transfer profits from the supplier to $M$, as with the participation fee.

In Proposition 1 we implicitly assumed that the intermediary has to choose the same mode for all of its products. This assumption is without loss of generality in this benchmark setting, given the informational advantage (whichever direction it is in) is consistent across products. An intermediary that offers some products directly itself (i.e. in the $R$-mode) and allows independent suppliers to sell other products over its platform (i.e. in the $M$-mode) would do strictly worse whenever $V_\delta \neq V_\gamma$. We explore settings in which such a hybrid mode would be chosen in Section 4.

## 3.1 Cross-product spillovers

In many real-world settings, marketing activities have cross-product spillovers. To reflect this in the simplest possible way, suppose higher levels of marketing for one product either increase or decrease the number of buyers for all other products. The idea is that there may be some systematic bias in the choice of marketing activities, so they are systematically set too high or too low if chosen independently by individual suppliers. The most natural case is that spillovers are negative, reflecting that buyers have limited attention and a higher level of marketing activities for one product reduces the chance a buyer pays attention to others. For example, while electronics manufacturers like Panasonic and Samsung likely know better how to present their latest high-definition television sets and the products' features to consumers in a retail store (Best Buy or Gome), relative to the retailers, each individual manufacturer might be tempted to "over-invest" in promoting its own television sets over those of other manufacturers (e.g. by spending excessively on product displays, and on hiring sales representatives that have expertise in promoting their specific product rather than in being able to help consumers select across products). Thus, the store owner likely can do better in terms of coordinating marketing activities across all TV sets in the store.

Assuming spillovers take a linear form, demand for product $i$ becomes

$$m - (a_i - a_i^*)^2 + x \sum_{j \neq i} a_j,$$

where $x$ is the magnitude of the spillovers. $R$'s profit at stage 2 if it sells $n$ products is

$$\Pi_R(n) = \max_{a_1, a_2, .., a_n} \left\{ (v - f) \sum_{i=1}^{n} E_R \left[ m - (a_i - a_i^*)^2 + x \sum_{j \neq i} a_j \right] - nF \right\}.$$

Compared to before, $R$ adjusts its marketing activities for product $i$ to take into account the externality

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on the $(n-1)$ other products, so

$$a_i^R = \theta + \gamma_i + \frac{x}{2}(n-1).$$

Substituting $a_i^R$ back into profits, $R$'s expected profit is

$$\begin{aligned}
\Pi_R(n) &= (v-f)\sum_{i=1}^{n} E\left[m - V_\delta + x(\theta+\gamma_i)(n-1) + \frac{x^2(n-1)^2}{4}\right] - nF \\
&= n\left((v-f)\left(m - V_\delta + x\theta(n-1) + \frac{x^2(n-1)^2}{4}\right) - F\right).
\end{aligned}$$

If $x < 0$ then assumption (1) is no longer sufficient to ensure intermediaries prefer to operate with all $N$ products. We assume instead

$$(v-f)[m - \max(V_\delta, V_\gamma) + x\theta(2N-1)] > F, \tag{8}$$

which requires that $x$ cannot be too negative. Under this assumption, $R$ will want to offer all $N$ products and obtains expected profit

$$\Pi_R = N\left((v-f)\left(m - V_\delta + x\theta(N-1) + \frac{x^2(N-1)^2}{4}\right) - F\right). \tag{9}$$

In contrast, an individual supplier selling over $M$ obtains expected profit of

$$\pi_i = (v-f)E_i\left[m - (a_i - a_i^*)^2 + x\sum_{j \neq i} a_j\right] - F,$$

so it ignores the effect of its choice of marketing activities on other suppliers. The result of profit maximization is $a_i^M = \theta + \delta_i$, as before, and so $M$'s expected profit from each supplier is

$$\pi_i = (v-f)(m - V_\gamma + x\theta(m-1)) - F.$$

Again, (8) ensures $M$ will offer all $N$ products even if $x < 0$, and obtain an expected profit of

$$\Pi_M = N((v-f)(m - V_\gamma + x\theta(N-1)) - F). \tag{10}$$

Comparing (9) and (10) we obtain:

**Proposition 2** *The $M$-mode is preferred to the $R$-mode if and only if $V_\delta \geq V_\gamma + \frac{x^2(N-1)^2}{4}$.*

Introducing spillovers unambiguously shifts the tradeoff in favor of the $R$-mode. Thus, the $R$-mode may now be preferred even if $V_\delta > V_\gamma$. This reflects that $R$ takes into account the cross-product externalities from the promotion of product $i$ on other products, something $M$ cannot do if suppliers cannot coordinate their decisions and $M$ cannot condition on suppliers' choices of marketing activity. As a result, the $M$-mode is preferred whenever suppliers' informational advantage in exploiting local information more than offsets the importance of accounting for externalities. Note that the sign of the externality $x$ (i.e. whether spillovers are positive or negative) does not matter in this case — all that matters is its magnitude. Also note that variable fees remain redundant since they do not influence an individual supplier's choice of marketing activities.

## 3.2 Cost differences

In this section we focus on the effect of cost differences between $R$ and $M$. Recall in the benchmark setting we assumed $F_R = F_M$ and $f_R = f_M$. Consider relaxing these equalities. (4) and (7) become

$$
\begin{aligned}
\Pi_R &= N\left(\left(v - f_R\right)\left(m - V_\delta\right) - F_R\right) \\
\Pi_M &= N\left(\left(v - f_M\right)\left(m - V_\gamma\right) - F_M\right).
\end{aligned}
$$

Given (1) both expressions are positive. Comparing the two, we get:

**Proposition 3** *The $M$-mode is preferred to the $R$-mode if and only if:*

$$
\left(v - f_R\right)V_\delta \geq \left(v - f_M\right)V_\gamma + \left(f_M - f_R\right)m + F_M - F_R. \tag{11}
$$

*The $M$-mode is relatively more profitable if products are long-tail (popular), i.e. if $m$ is low. Conversely, the $R$-mode is relatively more profitable if products are short-tail (popular), i.e. if $m$ is high.*

In general, the effect of cost differences on the benchmark tradeoff is ambiguous — it depends on the magnitude of variable cost saving under the $R$-mode versus the decrease in fixed costs under the $M$-mode. Indeed, it is natural to assume that $F_R > F_M$ and $f_M > f_R$. This means that the fixed cost to $R$ of offering an additional product is higher than the fixed cost of each additional supplier signing up with $M$. The fixed cost to $R$ could include the cost of quality inspection for each new product, contract negotiations with the new supplier, expansion of inventory storage, distribution and delivery services to handle the additional product, and so on. On the other hand, $R$ generally has lower

unit costs for any given product sold relative to sellers of individual products, reflecting $R$'s superior efficiency in activities such as inventory handling, payment, and order fulfillment. The assumption $f_M > f_R$ implies that the factor $(f_M - f_R) m$ shifts the tradeoff in favor of $R$, but more so when products have high values of $m$ (i.e. short-tail or popular products) than if products have low values of $m$ (i.e. long-tail or unpopular products). It also implies that the informational disadvantage of $R$ (not observing $\delta_i$ shocks) is magnified by its higher margins, while the informational disadvantage of $M$ (not observing $\gamma_i$ shocks) is dampened by its lower margins.

## 3.3   Network effects with unfavorable expectations

Previously, we have assumed that the number of buyers for each supplier does not depend on how many suppliers the buyer can purchase from. If buyers are more likely to come to an intermediary with more suppliers present (or offering more products), then suppliers' expectations can matter. To capture this, consider the case $m$ increases in $n$. This captures a possible cross-group network effect between suppliers and buyers. This could arise either because the more products that are made available, the more buyers will become aware of and willing to use the intermediary (e.g. through word of mouth, reputation effects or other sources of information and review) and/or the more likely a given buyer that is informed about and interested in a particular product available through the intermediary will find other products of interest through the intermediary. In other words, we allow for positive agglomeration effects, contained in $m(n)$. We normalize $m \equiv m(N)$. To ensure $M$ is always profitable we add to (1) the new assumption that

$$(v - f)(m(1) - V_\gamma) > F. \tag{12}$$

The previous analysis remains valid in the presence of this network effect provided all $N$ suppliers participate on the marketplace in equilibrium. This is the case when $M$ benefits from favorable expectations — i.e. suppliers always coordinate on joining if they make non-negative profits in the resulting equilibrium. Since $m$ is increasing in $n$, the marketplace wants to sign up all $N$ suppliers. $R$'s problem is also unaffected. Suppliers do not need to form expectations of how many other suppliers join when deciding whether or not to sell to $R$, since their payoff is independent of how many buyers show up.

Let us now examine the case in which suppliers hold unfavorable expectations, i.e. they coordinate on not adopting whenever this is an equilibrium. This scenario is particularly relevant for marketplaces

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that are part of early-stage ventures. Our treatment of unfavorable expectations follows Caillaud and Jullien (2003), Hagiu and Spulber (2013), and Halaburda and Yehezkel (2013).

The optimal choices of marketing by suppliers are unchanged compared to section 3 because individual suppliers do not take into account the number of other suppliers that join when choosing their marketing activities. Thus, each individual supplier's expected net profit from joining $M$ when it expects $n^e \geq 0$ other suppliers to join is $(v - f)(m(n^e + 1) - V_\gamma) - F - P$, where $P$ is the access fee charged by $M$. We denote this profit $\pi(n^e + 1) - P$. When suppliers hold unfavorable expectations, for any given $P$, each supplier expects no other supplier to join whenever this is an equilibrium, i.e. whenever $\pi(1) - P \leq 0$. In this case, if $M$ charges $P > \pi(1)$, then no suppliers join (this is an equilibrium in the subgame, and it prevails under unfavorable expectations). Thus, the maximum price that $M$ can charge so that suppliers join is $P = \pi(1)$. At this price, the only equilibrium is that all $N$ suppliers offered the contract join and expect all other suppliers to join. The profit extracted by $M$ is therefore $N\pi(1)$, which is equal to

$$\Pi_M = N((v - f)(m(1) - V_\gamma) - F). \tag{13}$$

Note that (13) is less than (7) given $m$ is increasing in $n$, so that unfavorable expectations lower $M$'s profit. Assumption (12) ensures that $M$ still prefers to attract all $N$ suppliers. Comparing (13) with (4), we have:

**Proposition 4** *When $m$ is increasing in $n$ and given the intermediary faces unfavorable expectations, the M-mode is preferred to the R-mode if and only if*

$$V_\delta \geq V_\gamma + m(N) - m(1). \tag{14}$$

Unfavorable expectations shift the tradeoff unambiguously in favor of the *R-mode*, which may now be preferred even when the local information of individual suppliers is more important. The additional term on the right hand side of the inequality captures the size of the network effect. The *R-mode* allows the intermediary to sidestep the unfavorable expectations problem that the *M-mode* can run into.

There are two ways for $M$ to mitigate the problem arising from network effects and unfavorable expectations. One is to offer some products under the *R*-mode, an option we analyze in Section 4. The other option is to charge a variable fee per unit of sales (if it can observe supplier sales). This can

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eliminate the need to set a fixed participation fee, and so reduces the role of network effects. In fact, if $M$ can pay suppliers to join, then it can completely overcome unfavorable expectations by subsidizing the suppliers' fixed participation costs and extracting all of their rents through variable fees. This leads to (almost) the same profits as under favorable expectations. Such subsidies may, however, not be feasible, for instance because they could lead to an adverse selection problem in which firms that are not genuine suppliers join simply to collect the subsidy. In the Appendix we prove:

**Proposition 5** *When $m$ is increasing in $n$, the intermediary faces unfavorable expectations, the marketplace can observe and condition on suppliers' sales but cannot subsidize suppliers to join the marketplace, the $M$-mode is preferred to the $R$-mode if and only if*

$$V_\delta \geq V_\gamma + \rho \left( m\left( N \right) - m\left( 1 \right) \right), \tag{15}$$

*where*

$$\rho = \frac{F}{\left( v - f \right) \left( m\left( 1 \right) - V_\gamma \right)} \in \left( 0, 1 \right).$$

Comparing (15) with (14), the effect of network effects is dampened by the multiplying factor $\rho$ which lies strictly between 0 and 1. Thus, while the intermediary's choice is still unambiguously titled towards the *R-mode* in the face of network effects and unfavorable expectations, variable fees do help to mitigate the effect.

# 4  Hybrid modes

So far we have focused on an intermediary that has to choose between the *M-mode* and the *R-mode*. In section 3 we noted that an intermediary that could offer some products under each mode would not want to do so. In reality, intermediaries that sell products using both modes are quite prevalent. Amazon is a prominent example. Closer to our model are the examples of Best Buy and department stores. In the sections that follow, we highlight several key factors which can make a hybrid mode optimal.

## 4.1  Heterogenous information

In our benchmark model, we have assumed the variances of supplier and intermediary information, respectively, are the same for all products. Suppose instead they are different, such that for all

$i \in S_R \subset [N] \equiv \{1, .., N\}$ we have $Var(\gamma_i) > Var(\delta_i)$, and for all $i \in S_M = [N] \backslash S_R$ we have $Var(\gamma_i) < Var(\delta_i)$. It is then straightforward to see:

**Proposition 6** *The intermediary's optimal strategy is to offer all products $i \in S_R$ in the R-mode and all products $i \in S_M$ in the M-mode.*

In other words, the intermediary should use the $R$-mode for all products where it has an informational advantage over suppliers and the $M$-mode for all products where the advantage lies with suppliers.

## 4.2   Heterogenous spillovers

As we have seen, spillovers across products unambiguously shift the basic tradeoff in favor of the $R$-*mode*. If all spillovers are the same as we assumed in Section 3.1, then the optimal model is still either a pure reseller or a pure marketplace. In reality, spillovers may be asymmetric, i.e. some products generate larger spillovers than others. In such scenarios, if suppliers' information is more important than reseller information, it may be optimal to have some products offered in the $M$-mode (those products for which marketing does not generate any systematic and significant spillovers) and others offered in the $R$-*mode* (those products for which marketing generates a consistent and important spillover in one direction).

To illustrate, suppose there exists a partition of $[N]$ into two sets $S_R$ and $S_M = [N] \backslash S_R$, such that all products $i \in S_R$ generate spillovers equal to $x$ among each other but no spillovers on products $i \in S_M$, and products $i \in S_M$ generate no spillovers whatsoever. Then the profits of the intermediary can be decomposed into the two sets of products, with the profits being separable across the two groups. Thus, proposition 2 applies to the group of products in $S_R$ and proposition 1 applies to the group of products in $S_M$. We obtain:

**Proposition 7** *Suppose all products $i \in S_R$ generate spillovers equal to $x$ on each other, while products $i \in S_M$ do not generate nor receive any spillovers. The intermediary chooses the interior hybrid mode in which it offers products $i \in S_R$ under the R-mode and products $i \in S_M$ under the M-mode if and only if*

$$V_\gamma < V_\delta \le V_\gamma + \frac{(N_R - 1)^2 x^2}{4}.$$

*Otherwise, if $V_\delta \le V_\gamma$ then the intermediary chooses the pure R-mode; if $V_\delta > V_\gamma + \frac{(N_R-1)^2 x^2}{4}$ then the intermediary chooses the pure M-mode.*

Clearly the pure *R-mode* dominates if $V_\delta \leq V_\gamma$. Not only does $R$ have an information advantage for all products, but it can fully internalize the effect of the spillovers between products in $S_R$. If $V_\delta > V_\gamma$, then the information advantage rests with the suppliers, so the *M-mode* is preferred for those products in $S_M$ for which there are no spillovers. If $V_\delta$ is sufficiently high, this information advantage will more than offset the benefit of coordinating marketing activities, and the intermediary will prefer the *M-mode* even for the products in $S_R$.

A more interesting case arises if the spillovers generated from products in $S_R$ extend to all products. In this case, even if the intermediary controls all products in $S_R$ under the *R-mode* it will still not internalize all the spillovers they create. There can then be a role for offering some additional products (i.e. some from $S_M$) in the *R-mode*. In the appendix, we prove:

**Proposition 8** *Suppose all products $i \in S_R$ generate spillovers equal to $x$ on all other products, while products $i \in S_M$ do not generate any spillovers. Assume $N_R^2 + N_R > 2N - 1$. Then the optimal mode is:*

- *pure R-mode if $V_\delta - V_\gamma \leq \frac{x^2}{4} N_R$*

- *sell $N_R$ products in $S_R$ and $k^*$ products from $S_M$ under the R-mode and all other products under the M-mode if $\frac{x^2}{4} N_R \leq V_\delta - V_\gamma \leq \frac{x^2}{4} \left(1 - N_R^2 + 2N(N_R - 1)\right)$, where $k^* \in [1, N - N_R - 1]$ satisfies the following bounds*

$$(N - N_R) - \frac{2(V_\delta - V_\gamma)}{N_R x^2} - \frac{1}{2} < k^* < (N - N_R) - \frac{2(V_\delta - V_\gamma)}{N_R x^2} + \frac{1}{2} \tag{16}$$

- *pure M-mode if $V_\delta - V_\gamma \geq \frac{x^2}{4} \left(1 - N_R^2 + 2N(N_R - 1)\right)$.*

Once again, the pure *R-mode* dominates if $V_\delta \leq V_\gamma$. In case $V_\delta > V_\gamma$, the intermediary now faces a tradeoff. Suppliers within $S_M$ enjoy an information advantage, but, by taking control of some products from $S_M$, the intermediary can better internalize the spillovers generated by the marketing choices of products in $S_R$. This also raises the amount that independent suppliers are willing to pay to join, given that the marketing activities of products in $S_R$ are better optimized in terms of the spillovers they create.

## 4.3 Heterogeneous products and cost differences

Suppose the value of $m$ differs across products so that $m_1 \leq m_2 \leq ... \leq m_N$ with at least one inequality strict. Some products are long-tail products (have low $m_i$) and some products are short-tail products (have high $m_i$). Furthermore, assume there are cost differences as in Section 3.2. Then the profit the intermediary obtains from product $i$ if it operates in the *R-mode* is $(v - f_R)(m_i - V_\delta) - F_R$. Allowing $M$ to set different participation fees for the different products to reflect the different values of $m$, the profit the intermediary obtains from product $i$ if it operates in the *M-mode* is $(v - f_M)(m_i - V_\gamma) - F_M$. Then it follows:

**Proposition 9** *The intermediary's optimal strategy is to offer products $i$ such that $m_i \leq m^*$ in the M-mode and products $i$ such that $m_i > m^*$ in the R-mode, where the cutoff $m^*$ is given by*

$$m^* = \frac{V_\delta (v - f_R) - V_\gamma (v - f_M) + F_R - F_M}{f_M - f_R}.$$

*In other words, an intermediary facing heterogeneous demands should sell long-tail products in the M-mode and short-tail products in the R-mode.*

## 4.4 Unfavorable expectations

Suppose, as in section 3.3 that $m$ is increasing in $n$, i.e. there are network effects. In this case, the presence of unfavorable expectations creates a natural reason for the intermediary to choose a hybrid strategy: offer a sufficient number of products under the *R-mode* in order to overcome unfavorable expectations, but not too many if suppliers' local information is more important than the intermediary's.

Suppose the intermediary offers $0 \leq n_R \leq N$ products under the *R-mode* and $(N - n_R)$ products under the *M-mode*. Unfavorable expectations means that independent suppliers expect the intermediary will only be able to offer the $n_R$ products it has bought as a reseller whenever it is an equilibrium for the independent suppliers not to affiliate (i.e. when their surplus is negative if they each assume all the other independent suppliers do not affiliate). Thus, the amount the intermediary can extract from independent suppliers (if $n_R < N$) is

$$(N - n_R)((v - f)(m(n_R + 1) - V_\gamma) - F).$$

Its profit from selling the remaining $n_R$ products itself is

$$n_R \left( (v - f) \left( m \left( N \right) - V_\delta \right) - F \right).$$

Adding the two components of profit, the intermediary's expected profit is

$$\Pi \left( n_R \right) = \left( v - f \right) \left( \begin{array}{c} \left( N - n_R \right) m \left( n_R + 1 \right) + n_R m \left( N \right) \\ - \left( N - n_R \right) V_\gamma - n_R V_\delta \end{array} \right) - nF. \tag{17}$$

Since $m \left( N \right) > m \left( n_R + 1 \right)$ and since $m \left( n_R + 1 \right)$ is increasing in $n_R$ for $n_R < N - 1$, the first term in square brackets is unambiguously increasing in $n_R$ up to $n_R = N - 1$. This represents the fact that the R-mode allows the intermediary to avoid unfavorable expectations, so shifting more products to this mode increases profit. By itself, this term would push the intermediary to offer all products in the R-mode.[4] However, if $V_\delta > V_\gamma$, then the second term in square brackets is decreasing in $n_R$. This is due to the informational advantage of suppliers in the M-mode. Thus, there can be a tradeoff. Offering more products in the R-mode helps overcome unfavorable expectations but it loses valuable supplier information. The following proposition is proven in the appendix.

**Proposition 10** *Suppose $m \left( n_K \right) = m - \alpha \left( N - n_K \right)$ for $1 \leq n_K \leq N$, with $\alpha > 0$. If $V_\delta \leq V_\gamma$, then the intermediary will choose to offer all products in the R-mode. If $V_\gamma < V_\delta < V_\gamma + 2\alpha \left( N - 1 \right)$, the intermediary will adopt a hybrid mode. If $V_\delta \geq V_\gamma + 2\alpha \left( N - 1 \right)$, the intermediary will offer all products in the M-mode. In the case that the intermediary adopts the hybrid solution, the optimal number of products $n_R^*$ offered in the R-mode is bounded by the inequalities*

$$N - 1 - \frac{V_\delta - V_\gamma}{2\alpha} < n_R^* < N - \frac{V_\delta - V_\gamma}{2\alpha}. \tag{18}$$

If $V_\delta \leq V_\gamma$, then the R-mode dominates both on informational grounds and as a way to overcome unfavorable expectations. When $V_\delta > V_\gamma$, offering $N - 1$ products in the R-mode fully overcomes pessimistic expectations, leaving one product to be offered in the M-mode to exploit the information advantage suppliers have in this case. Of course, once $V_\delta$ is sufficiently large relative to $V_\gamma$, it is optimal to offer all products in the M-mode. Note the bounds in (18) for the optimum number of products sold in the R-mode are decreasing in $V_\delta - V_\gamma$ (consistent with an informational advantage driving the

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[4]Note selling $N - 1$ products in the R-mode and one in the M-mode would be equivalent to selling all $N$ in the R-mode from the perspective of overcoming unfavorable expectations.

choice between the two modes) and increasing in the magnitude of network effects $\alpha$ (consistent with the finding of 3.3 that network effects are detrimental to the $M$-mode under unfavorable expectations).

# 5 Robustness

In this section we discuss the implications of some modifications to our setup, which are meant to highlight the robustness and general nature of the insights we have drawn.

## 5.1 Downward-sloping demand from suppliers

We have assumed that in the absence of network effects, both $M$ and $R$ can extract the entire expected surplus from suppliers. This was either because suppliers (and their products) were completely symmetric or, where they were not, because we implicitly assumed that intermediaries ($M$ in particular) could price discriminate, i.e. $M$ could observe any heterogeneity across suppliers and set different participation fees accordingly.

It is straightforward to extend our model to accommodate heterogeneity across products, such that the heterogeneous parameter (e.g. different $m_i$'s across products) is unobservable to the intermediary. In this case, the intermediary would be unable to extract the full supplier surplus and would therefore face a supplier demand for participation that is downward-sloping in the price(s) charged (under both modes). As long as the heterogeneous parameter does not affect marketing activities (for instance, heterogeneity in $m$ has no bearing on the choices of marketing activities), our main results and conclusions go through unchanged. In a Supplementary Appendix we provide a brief illustration of this point with heterogeneous $m$.

## 5.2 Buyer surplus and affiliation

We have assumed that buyer affiliation with the intermediary was costless and that the intermediary and/or the suppliers were able to extract the entire buyer surplus in all scenarios. These features of our model allowed us to avoid introducing any pricing distortions in the analysis. Our model can, however, be extended such that: (i) buyers incur heterogeneous opportunity costs when joining the intermediary (either $M$ or $R$); and (ii) buyers have positive bargaining power, which allows them to retain some surplus from their transactions with $R$ or the individual suppliers. In particular, we can allow $R$ to have greater (or equal) bargaining power over buyers relative to individual suppliers. This fits real-world scenarios in which $R$ aggregates the bargaining powers of many individual suppliers,

such as for example Intellectual Ventures in the market for patents (see Hagiu and Wright, 2013 and Hagiu and Yoffie, 2013).

It is straightforward to show that in this context our main tradeoffs remain unchanged. The benchmark tradeoff is simply augmented by terms which reflect the new differences between $M$ and $R$, namely that the $R$-mode allows the intermediary to extract more rents from buyers, but, for this exact reason, the $M$-mode attracts a larger number of buyers, as they expect to obtain a larger net surplus. The formalization of these results is contained in the Supplementary Appendix.

## 5.3 Other non-contractible decision variables

Throughout the paper, we have chosen to focus on marketing activities as the key non-contractible decision driving the difference between the two modes. As discussed in the introduction, however, there are other potentially non-contractible decisions that one could focus on. For example, if there are privately observed demand shocks, similar tradeoffs to those we have derived will arise when the non-contractible decisions are product prices rather than marketing activities. Consider the simplest possible setting. Suppose each supplier offers a single product, is subject to linear demand, and all variable costs are set to zero. The level of demand for each product is subject to two demand shocks, one which is only observed by the corresponding supplier and one which is only observed by $R$. For this case, one can show that essentially the same tradeoffs arise as in our benchmark model. The extent to which the $M$-mode is preferred over the $R$-mode boils down to whether the local information on demand by suppliers is more important (has higher variance) than the local information of the intermediary. In the case that products are independent, the tradeoff is in fact identical to our benchmark result in Proposition 1. Relative to this, the choice is shifted towards the $R$-mode to the extent there is a spillover in demand, which will be the case if products are substitutes or complements. This shows the result of Proposition 2 continues to apply.

# 6 Conclusions and managerial implications

We have established several fundamental tradeoffs faced by an intermediary when choosing whether to function more as a marketplace or more as a reseller. At the most basic level, a marketplace benefits from allowing suppliers to exploit their local information, whereas a reseller can exploit its own local information. Thus, as shown in our benchmark model, the marketplace-mode is preferred to the reseller-mode whenever the local information held by suppliers is more important than the

local information held by the reseller. This simple result contains a key part of the reason for which department stores have traditionally offered cosmetics products through dedicated "counters" where displays are designed and controlled by individual brands (and sales staff are assigned exclusively to and trained by specific brands) as in the $M$-mode, whereas other products (e.g. mass-market accessories such as watches, scarves, jewelry) are offered on displays controlled by the store and serviced by generalist sales personnel as in the $R$-mode. Cosmetics brands have highly specialized knowledge about how best to market specific products to consumers, which is hard for stores and their sales staff to accumulate (Koehn 2002). Such specialized knowledge is less important for mass-market accessories. Similarly, whereas many electronics manufacturers are content to let Best Buy control the sale of their products to consumers, Apple, Microsoft and Samsung have recently decided to run their own mini-stores within Best Buy based on the premise that they have superior information on how best to pitch their products to consumers. Finally, this tradeoff is also relevant in explaining why some digital content intermediaries such as Amazon's Kindle Store, Apple's iBooks Store, Apple's App Store and Google Play have adopted the marketplace mode, in which content or application suppliers control pricing, end-user licensing and customer support.

There are three other key factors that affect this baseline tradeoff. First, if marketing activities (or other non-contractible decisions) generate externalities across products, the reseller-mode becomes more attractive. This is because a reseller can internalize these externalities when it exerts its control rights, something that independent suppliers acting in an uncoordinated fashion cannot do. Thus, it would probably not make sense for Best Buy to allow *all* of its suppliers to operate independent mini-stores. Indeed, given the inherent competition between brands for consumer attention, the result would likely be an over-investment in fancy displays and brand-specific sales staff. Spillovers are likely important for explaining why cable TV operators predominately choose to operate in the reseller-mode, extracting more value by coordinating their pricing and marketing decisions across different channels (e.g. through bundling, and the cross marketing of different channels).

Second, when the reseller has higher fixed costs of handling each additional product than the marketplace, but lower marginal costs of handling additional sales of the same product, the tradeoff between the two modes depends on the level of demand for each product. The baseline tradeoff is shifted in favor of the marketplace when the intermediary handles a broad range of long-tail products (e.g. e-Bay, Etsy.com, the Flea Market of Saint-Ouen in Paris) and in favor of the reseller which has a more focused range of short-tail products (e.g. Eastbay, an online retailer focused mainly on athletic shoes; Gazelle, an online service that buys and resells used smartphones and tablets, focusing only on

the most popular models).

Third, if there are network effects, i.e. if more suppliers attract more buyers per supplier, and the marketplace faces unfavorable expectations (a common occurrence for early-stage marketplace ventures) then the baseline tradeoff is shifted in favor of the reseller. Indeed, operating as a reseller allows the intermediary to side-step the chicken-and-egg problem which plagues early-stage marketplaces. Thus, when starting up, intermediaries should consider adopting the reseller mode, given they are more likely to face a problem of unfavorable expectations initially. Once they overcome such unfavorable expectations, they can switch to the marketplace-mode. Thus, our analysis formalizes the discussion of a platform's start-up strategies in Hagiu and Eisenmann (2007). This approach was adopted by Amazon, who initially bought and resold books and other products. After it established a substantial base of buyers, the company first moved to open up a marketplace for attracting independent suppliers in 1999, four years after its initial launch (Casadesus-Masanell and Thaker, 2012). By 2011, the marketplace accounted for 30% of unit sales on Amazon.com (Hagiu and Wright, 2013).

Our model's predictions have clear managerial and empirical implications. To summarize, intermediaries should choose the marketplace (respectively, reseller) mode for the following types of products: (1) products for which suppliers have a significant (respectively, a small) information advantage about the best way to market products relative to the intermediary; (2) products whose prices and marketing activities have limited (respectively, large) spillovers on other products; (3) long-tail (respectively, short-tail) products; and (4) products provided by late stage (respectively, early stage) ventures. These implications not only apply to an intermediary choosing between positioning itself as a pure reseller or a pure marketplace, but to hybrid modes in which the intermediary needs to determine how many products (and in the case of heterogenous products, which products) to offer in each mode.

Our analysis has provided a new style of modeling intermediaries' strategic positioning decisions. There are many promising directions in which this analysis can be extended. First, one could generalize our analysis to allow the intermediary to take control of some non-contractible decisions and not others. Second, we have assumed the intermediary is essential for trade, but this need not be the case. The possibility of disintermediation may be of particular concern under the marketplace mode given suppliers and buyers get to interact directly, thereby constraining the level (and type) of fees that the marketplace can charge, and shifting an intermediary's choice towards the reseller mode. Related to this point, one could integrate the choice of intermediation mode into a framework in which the intermediary arises endogenously, in response to some friction (e.g. search costs or transaction costs) from direct trading between suppliers and buyers. Finally, one could study competing intermediaries,

and whether there is a tendency for different intermediation modes to emerge, possibly in a complementary relationship, or for one mode to drive out the other. Where different modes do emerge, they could appeal to different types of suppliers and buyers, and it would be interesting to study which types of suppliers and buyers are attracted to each mode.

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# Appendix

### Proof of Proposition 5

If $M$ can monitor supplier sales and charge a variable fee $p$ in addition to a non-negative fixed fee $P$, each individual supplier's expected profit from joining $M$ is $(v - p - f)(m(n^e) - V_\gamma) - F - P$. Under unfavorable expectations $P(p) = (v - p - f)(m(1) - V_\gamma) - F$, implying $M$'s expected profit is

$$
\begin{aligned}
\Pi_M^{UE}(p, n) &= n(P(p) + p(m(n) - V_\gamma)) \\
&= n((v - f)(m(1) - V_\gamma) + p(m(n) - m(1)) - F)
\end{aligned}
$$

if $n$ suppliers participate. Given $m(n) > m(1)$, $\Pi_M^{UE}(p, n)$ is strictly increasing in $p$ provided $v - p - f > 0$ so that the supplier still wants to sell units and choose the optimal level of marketing activities. Then $M$ optimally sets the highest possible $p$ such that $P \geq 0$. This is

$$
p = v - f - \frac{F}{m(1) - V_\gamma}.
$$

Note $0 < p < v - f$ given (12). At this price $p$, profits are clearly increasing in $n$ so $M$ optimally sets $n = N$. Its expected profit is

$$
N\left((v - f)(m(N) - V_\gamma) - \frac{m(N) - V_\gamma}{m(1) - V_\gamma}F\right)
$$

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which can be compared to $R$'s expected profit in (4). The comparison gives the expression in (15). The term $\rho$ in (15) satisfies $0 < \rho < 1$ given (12).

## Proof of Proposition 8

First, note that it is never optimal to sell any product $i \in S_M$ in the *R-mode* if there is at least one product $j \in S_R$ sold in the *M-mode*. Indeed, one could then profitably switch product $i$ to the *M-mode* and product $j$ to the *R-mode*. The only impact on profit would arise from the fact that marketing for $j$ creates spillovers which the $R$-mode internalizes while the $M$-mode does not. This implies that the intermediary should consider selling some products from $S_M$ in the $R$-mode only if all products in $S_R$ are sold in the $R$-mode.

Second, we show it is never optimal to sell some but not all products from $S_R$ in the $M$-mode. Let $S_0$ denote the set of $k \leq N_R$ products within $S_R$ that are sold under the $M$-mode. Then, for all $i \in S_0$, the optimal choice of marketing is $a_i = \theta + \gamma_i + x (N_R - k - 1)/2$. For all other $j$, the choice of marketing is $a_j = \theta + \delta_j$. Resulting intermediary profits are

$$
\begin{aligned}
\Pi(k) \;=\; & (v - f) \sum_{i \in S_R \backslash S_0} E \left[ m - \left( \frac{x(N_R - k - 1)}{2} - \delta_i \right)^2 + x \left( \begin{array}{c} \sum_{j \neq i, j \in S_R \backslash S_0} \left( \theta + \gamma_j + \frac{x(N_R - k - 1)}{2} \right) \\ + \sum_{j \in S_0} (\theta + \delta_j) \end{array} \right) \right] \\
& + (v - f) \sum_{i \in S_0} E \left[ m - \gamma_i^2 + x \left( \sum_{j \in S_R \backslash S_0} \left( \theta + \gamma_j + \frac{x(N_R - k - 1)}{2} \right) + \sum_{j \neq i, j \in S_0} (\theta + \delta_j) \right) \right] \\
& (v - f) \sum_{i \in S_M} E \left[ m - \gamma_i^2 + x \left( \sum_{j \in S_R \backslash S_0} \left( \theta + \gamma_j + \frac{x(N_R - k - 1)}{2} \right) + \sum_{j \in S_0} (\theta + \delta_j) \right) \right] - NF \\
\;=\; & (v - f) \left( \begin{array}{c} (N_R - k) \left( V_\gamma - V_\delta - \frac{x^2 ((N_R - k)^2 - 1)}{4} \right) - x N_R \theta \\ + N \left( m - V_\gamma + x N_R \theta + \frac{x^2 (N_R - k)(N_R - k - 1)}{2} \right) \end{array} \right) - NF.
\end{aligned}
$$

This expression is valid for $0 \leq k \leq N_R$.

Suppose there exists $k \in [1, N_R - 1]$ such that $\Pi(k) \geq \Pi(0)$ and $\Pi(k) \geq \Pi(N_R)$. These two inequalities are equivalent to

$$
\begin{aligned}
V_\delta - V_\gamma \;&\geq\; \frac{x^2}{4} \left[ 2N(2N_R - k - 1) + 3N_R k - 3N_R^2 - k^2 + 1 \right] \\
V_\delta - V_\gamma \;&\leq\; \frac{x^2}{4} (N_R - k - 1)(2N - 1 - (N_R - k))
\end{aligned}
$$

respectively. For both inequalities to hold requires $2N_R - k \geq 2N$, which is not possible given $N_R < N$ and $k \geq 0$ We have thus shown that selling some (but not all) products from $S_R$ in the $M$-mode is a

dominated strategy.

The other possible strategy to consider is that in addition to the $N_R$ products in $S_R$, the intermediary sells $k$ products from $S_M$ in the *R-mode*, where $0 \leq k \leq N - N_R$. Denote by $S_0$ the set of $k$ products from $S_M$ which are sold under the *R-mode*. The intermediary chooses marketing activities $a_i = \theta + \gamma_i + x(N_R + k - 1)/2$ for products $i \in S_R$ and $a_i = \theta + \gamma_i$ for products $i \in S_0$ (the latter create no spillovers). Independent suppliers set $a_i = \theta + \delta_i$ for the remaining products $i \in S_M \backslash S_0$. The intermediary's profit is therefore

$$
\begin{aligned}
\Pi(k) = &(v - f) \sum_{i \in S_R} E\left[ m - \left( \frac{x(N_R + k - 1)}{2} - \delta_i \right)^2 + x \sum_{j \neq i, j \in S_R} \left( \theta + \gamma_j + \frac{x(N_R + k - 1)}{2} \right) \right] \\
& + (v - f) \sum_{i \in S_0} E\left[ m - \delta_i^2 + x \sum_{j \in S_R} \left( \theta + \gamma_j + \frac{x(N_R + k - 1)}{2} \right) \right] \\
& + (v - f) \sum_{i \in S_M \backslash S_0} E\left[ m - \gamma_i^2 + x \sum_{j \in S_R} \left( \theta + \gamma_j + \frac{x(N_R + k - 1)}{2} \right) \right] - NF \\
= &(v - f) \left( \begin{array}{c} (N_R + k)(V_\gamma - V_\delta) + N(m - V_\gamma) + x\theta N_R(N - 1) \\ + \frac{x^2}{4} N_R (N_R + k - 1)(2N - N_R - k - 1) \end{array} \right) - NF.
\end{aligned}
$$

We therefore have

$$
\Pi(k) \geq \Pi(k - 1) \iff V_\delta - V_\gamma < \frac{x^2}{4} N_R (2(N - N_R) + 1 - 2k).
$$

Note the right hand side of the last inequality is strictly decreasing in $k$. Thus, there is a unique value of $k^*$ that maximizes $\Pi(k)$ over $k \in [0, N - N_R]$. In particular, $k^* = N - N_R$ (i.e. the *R-mode*) is optimal if $V_\delta - V_\gamma \leq \frac{x^2}{4} N_R$. On the other hand, $k^* = 0$ (i.e. only the products in $S_R$ are sold in the *R-mode*) is optimal if

$$
V_\delta - V_\gamma \geq \frac{x^2}{4} N_R [2(N - N_R) - 1]. \tag{19}
$$

Otherwise, $k^*$ satisfies the bounds in (16).

The intermediary's profit is then $\max \{\Pi(k^*), \Pi_M\}$, where $\Pi_M$ is the profit obtained with the *M-mode*

$$
\Pi_M = (v - f)[N(m - V_\gamma) + x\theta N_R(N - 1)] - NF.
$$

The M-mode yields higher profits than $\Pi(0)$ if and only if

$$V_\delta - V_\gamma \geq \frac{x^2}{4}\left(1 - N_R^2 + 2N(N_R - 1)\right). \tag{20}$$

Since $N_R^2 + N_R \geq 2N - 1$, we have that (20) implies (19). Thus, if $\Pi_M > \Pi(0)$ then the M-mode will be chosen. If on the other hand $\Pi_M \leq \Pi(0)$ then the optimal solution is given by the $k^*$ characterized above.

## Proof of Proposition 10

Compare intermediary profits in (17) with $n_R$ products in the R-mode versus $n_R - 1$ products in the R-mode. Offering $n_R$ products in the R-mode is better than offering $n_R - 1$ products if and only if $2\alpha(N - n_R) + V_\gamma > V_\delta$. Starting from $n_R = 1$, the left-hand side of the inequality is strictly decreasing in $n_R$, so there will be a unique optimal value of $n_R$ for all parameter values. The intermediary's profit is higher with $n_R = 0$ than with $n_R = 1$ if and only if $V_\delta > V_\gamma + 2\alpha(N - 1)$, which implies the optimal $n_R$ is 0. Likewise, the intermediary's profit is higher with $n_R = N$ than with $n_R = N - 1$ if and only if $V_\delta < V_\gamma$, which implies the optimal $n_R$ is $N$. The optimal model is therefore an interior hybrid whenever $V_\gamma < V_\delta < V_\gamma + 2\alpha(N - 1)$. In this case, the optimal number $n_R^*$ satisfies $2\alpha(N - n_R^*) + V_\gamma > V_\delta$ and $2\alpha(N - (n_R^* + 1)) + V_\gamma < V_\delta$, so its bounds are determined in (18).

# Supplementary Appendix

This appendix can be separated from the paper if desired. It is used to formally establish the claims made in Section 5.

## Downward-sloping supplier demand

Suppose suppliers are heterogeneous in $m$, i.e. $m$ is distributed on $[m_L, m_H]$ with c.d.f. $G(.)$ and corresponding density $g(.)$, and that the intermediary does not observe each individual supplier's $m_i$. We also assume:

$$(v - f)(m_L - \max(V_\gamma, V_\delta)) > F$$

so that all products are profitable. Given unobserved heterogeneity in $m$, it is natural to allow both $M$ and $R$ to charge fixed and variable fees. Specifically, $M$ charges the fixed fee $P_M$ and the variable fee $p$, while the reseller charges the fixed fee $P_R$ and offers suppliers a bid $b$ per product unit it buys from them.

Consider first the M-mode. A supplier with $m_i = m$ participates in the marketplace if and only if

$$m \geq \widehat{m} \equiv \frac{P_M + F}{v - f - p} + V_\gamma.$$

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Thus, $M$'s profit is

$$\max_{P_M,p} \{(P_M + pE(m \geq \widehat{m}))(1 - G(\widehat{m}))\}$$
$$= \max_{\widehat{m},p} \{((v-f)(m - V_\gamma) + p(E(m \geq \widehat{m}) - m) - F)(1 - G(\widehat{m}))\}.$$

Clearly the last expression is increasing in $p$ so the optimal $p$ is $v - f - \varepsilon$, with $\varepsilon$ being arbitrarily small. We obtain

$$\Pi_M = \max_{\widehat{m}} \{((v-f)(E(m \geq \widehat{m}) - V_\gamma) - F)(1 - G(\widehat{m}))\}. \tag{21}$$

Similarly, $R$'s profit is

$$\max_{P_R,b} \{(P_R + (v - f - b)(E(m \geq \widehat{m}) - V_\delta) - F)(1 - G(\widehat{m}))\},$$

where

$$b(\widehat{m} - V_\delta) - P_R = 0$$

so that $R$'s profit can be rewritten as

$$\max_{\widehat{m},b} \{(b(\widehat{m} - V_\delta) + (v - f - b)(E(m \geq \widehat{m}) - V_\delta) - F)(1 - G(\widehat{m}))\}.$$

The last expression is decreasing in $b$ so the optimal $b$ is equal to $\varepsilon$, where $\varepsilon$ is arbitrarily close to zero. We obtain

$$\Pi_R = \max_{\widehat{m}} \{((v-f)(E(m \geq \widehat{m}) - V_\delta) - F)(1 - G(\widehat{m}))\}. \tag{22}$$

Comparing the two profits (21) and (22), it is clear that $M$ is preferred to $R$ if and only if $V_\delta > V_\gamma$, the same condition as in our benchmark model. It is also straightforward to prove that in the current setting with no cost differences, an interior hybrid mode is never optimal. This feature also parallels the benchmark model.

### Buyer surplus and affiliation

Assume buyers incur heterogeneous opportunity costs $c$ when joining the intermediary ($M$ or $R$), where $c$ is distributed with the c.d.f $D(.)$. Furthermore, we replace the pricing mechanism in the main text with Nash bargaining. Specifically, we assume that after joining the intermediary, each buyer engages in Nash bargaining with the owner of the product $i$ she is interested in. When supplier $i$ sells directly to buyers (in the $M$-mode), supplier $i$'s bargaining power is $\alpha_M$ so that the supplier's and buyer's payoffs from the interaction are

$$\pi_M = \alpha_M(v - f_M) \text{ and } s_M = (1 - \alpha_M)(v - f_M).$$

When $R$ sells to buyers, its bargaining power is $\alpha_R \geq \alpha_M$. This captures the fact that $R$ aggregates the bargaining power of all suppliers. In this case, $R$'s and the buyer's payoffs from one product transaction are

$$\pi_R = \alpha_R(v - f_R) \text{ and } s_R = (1 - \alpha_R)(v - f_R).$$

Since it is assumed $f_M \geq f_R$ and $\alpha_M \leq \alpha_R$, we always have $\pi_R \geq \pi_M$. On the other hand, it is possible that $s_M \geq s_R$ (i.e. buyers may derive more surplus from their interactions with individual suppliers on $M$ because they have more relative bargaining power, which may compensate for the higher cost). We also allow $M$ and $R$ to have different fixed costs, $F_R$ and $F_M$ respectively, as in section 3.2.

Finally, to keep things simple, we assume the intermediary cannot charge any fixed fees to buyers for affiliation (neither as $M$ nor as $R$). If this was possible, $M$ may be able to partially offset the inferior bargaining power of its suppliers relative to $R$.

The rest of the model is unchanged. Assuming that each buyer is interested in one product only, demand for product $i$ is now

$$\left[m - (a_i - a_i^*)^2\right] D(s_M) \text{ if the intermediary behaves as a marketplace}$$

$$\left[m - (a_i - a_i^*)^2\right] D(s_R) \text{ if the intermediary behaves as a reseller.}$$

These expressions suggests that the *M-mode* now has an additional advantage whenever $s_M > s_R$ since it creates more buyer demand as buyers retain more surplus.

With these demand expressions, it is straightforward to derive the profits of $M$ and $R$ (the analysis is almost identical to the one in section 3.2), obtaining

$$
\begin{aligned}
\Pi_R(N) &= N(\pi_R(m - V_\delta) D(s_R) - F_R) \\
\Pi_M(N) &= N(\pi_M(m - V_\gamma) D(s_M) - F_M).
\end{aligned}
$$

Taking the difference and re-arranging terms, we obtain that the *M-mode* is preferred to the *R-mode* if and only if

$$\pi_R D(s_R) V_\delta > \pi_M D(s_M) V_\gamma + m(\pi_R D(s_R) - \pi_M D(s_M)) - (F_R - F_M),$$

which is similar to the tradeoff including cost differences expressed in (11). The only difference is that $(v - f_M)$ and $(v - f_R)$ have been replaced by the more general terms $\pi_M D(s_M)$ and $\pi_R D(s_R)$, respectively.

If we eliminate cost differences by setting $f_R = f_M = f$ and $F_R = F_M = F$, then, since $m > V_\gamma$ by assumption, the tradeoff is shifted in favor of $M$ relative to the benchmark tradeoff in Proposition 1 if and only if:

$$\pi_M D(s_M) > \pi_R D(s_R),$$

i.e. if and only if

$$\alpha_M(v - f) D((1 - \alpha_M)(v - f)) > \alpha_R(v - f) D((1 - \alpha_R)(v - f)).$$

This represents a simple tradeoff: the *R-mode* allows the intermediary to extract more rents out of the buyers who join, but for this exact reason the *M-mode* may attract a larger number of buyers.

## Price as the non-contractible decision variable

Suppose there are $N$ products with demand for product $i$ given by

$$m + \delta_i + \gamma_i - p_i + \frac{x}{N-1} \sum_{j \neq i} p_j,$$

where $-1 < x < 1$. The demand shock $\delta_i$ is the local information of supplier $i$ and the demand shock $\gamma_i$ is the local information of the intermediary. We assume $\delta_i$ and $\gamma_i$ are i.i.d. draws from independent distributions, with expected values and variances $V_\delta$ and $V_\gamma$, respectively. All marginal and fixed costs are set to zero for simplicity, and so there are no cost differences between the two modes, as in section 3.

$R$ does not observe $(\delta_1, ..., \delta_N)$ but can set $(p_1, ..., p_N)$ to account for demand spillovers and its local information $(\gamma_1, ..., \gamma_N)$. It therefore solves

$$\max_{p_1, ..., p_N} \left\{ \sum_{i=1}^{N} p_i \left( m + \gamma_i - p_i + \frac{x}{N-1} \sum_{j \neq i} p_j \right) \right\}.$$

The first-order condition in $p_i$ yields

$$p_i^* = \frac{m + \gamma_i}{2} + \frac{x}{N-1} \sum_{j \neq i} p_j^*. \tag{23}$$

Taking the sum of these conditions over $i = 1, .., N$, and noting $\sum_{i=1}^{N} \sum_{j \neq i} p_j^* = (N-1) \sum_{i=1}^{N} p_i^*$ we obtain

$$\sum_{i=1}^{N} p_i^* = \frac{Nm}{2(1-x)} + \frac{\sum_{i=1}^{N} \gamma_i}{2(1-x)}. \tag{24}$$

Subtracting (23) from (24) we can obtain $\sum_{j \neq i} p_j^*$, and substituting this into (23) we obtain

$$p_i^* = \frac{m}{2(1-x)} + \frac{a}{2}\gamma_i + \frac{b}{2} \sum_{j \neq i} \gamma_j,$$

where the parameters $a$ and $b$ are defined by

$$a \equiv \frac{(N-1) - (N-2)x}{(N-1) - (N-2)x - x^2}$$
$$b = \frac{x}{(N-1) - (N-2)x - x^2}.$$

From the perspective of the initial stage

$$\Pi_R = \sum_{i=1}^{N} \left[ E\left[p_i^* m\right] + E\left[p_i^* \gamma_i\right] - E\left[(p_i^*)^2\right] + \frac{x}{N-1} \sum_{j \neq i} E\left[p_i^* p_j^*\right] \right].$$

We have

$$E\left[p_i^* m\right] = \frac{m^2}{2(1-x)} \quad ; \quad E\left[p_i^* \gamma_i\right] = \frac{a}{2} V_\gamma$$

$$E\left[(p_i^*)^2\right] = \frac{m^2}{4(1-x)^2} + \frac{a^2 + (N-1)b^2}{4} V_\gamma$$

$$E\left[p_i^* p_j^*\right] = \frac{m^2}{4(1-x)^2} + \frac{2ab + (N-2)b^2}{4} V_\gamma.$$

Plugging these expressions in $\Pi_R$ above and using the definitions of $a$ and $b$, we finally obtain

$$\Pi_R = N \left( \frac{m^2}{4(1-x)} + \frac{(N-1-x(N-2))}{4(1-x)(N-1+x)} V_\gamma \right).$$

Consider now $M$'s problem. It sets a participation fee that extracts the entire expected surplus from each supplier. Supplier $i$ sets $p_i$ to maximize

$$\pi_i = p_i \left( m + \delta_i - p_i + \frac{x}{N-1} \sum_{j \neq i} E_i\left[p_j\right] \right),$$

where $E_i\left[p_j\right]$ denotes the expectation of $p_j$ from the perspective of supplier $i$. This implies

$$p_i^* = \frac{1}{2}\delta_i + \frac{1}{2} \left( m + \frac{x}{N-1} \sum_{j \neq i} E_i\left[p_j^*\right] \right). \tag{25}$$

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Taking expectations of both sides (and using that $E_i\left(\delta_j\right) = 0$) yields

$$E_i\left[p_j^*\right] = \frac{m}{2-x}. \tag{26}$$

Substituting (26) into (25), we obtain

$$p_i^* = \frac{1}{2}\delta_i + \frac{m}{2-x}.$$

Substituting $p_i^*$ into $\pi_i$ and taking expectations, we obtain

$$\pi_i = \frac{V_\delta}{4} + \frac{m^2}{(2-x)^2}.$$

Thus, summing over all $N$ suppliers implies

$$\Pi_M = N\left(\frac{V_\delta}{4} + \frac{m^2}{(2-x)^2}\right).$$

We can now compare the resulting profits under the two intermediation modes by taking the difference. We obtain

$$\Pi_M - \Pi_R = N\left(\frac{V_\delta}{4} - \frac{(N-1-x(N-2))}{4(1-x)(N-1+x)}V_\gamma - \frac{m^2 x^2}{4(1-x)(2-x)^2}\right).$$

This difference is clearly increasing in $V_\delta$ and decreasing in $V_\gamma$, so the $M$-mode is preferred when $V_\delta$ is sufficiently high, whereas the $R$-mode is preferred when $V_\gamma$ is sufficiently high. If there are no spillovers so $x = 0$, then $\Pi_M - \Pi_R = N\left(V_\delta - V_\gamma\right)/4$, so the tradeoff is identical to the one given in Proposition 1. Moreover, it is easily verified that $\Pi_M - \Pi_R$ is decreasing in $|x|$. Thus, the presence of spillovers unambiguously shifts the tradeoff in favor of $R$, regardless of their sign. This result corroborates the one obtained in Proposition 2.